

The Fossil Pelecinid *Pelecinopteron tubuliforme* Brues in Baltic Amber (Hymenoptera: Pelecinidae)

MICHAEL S. ENGEL

Department of Ecology and Evolutionary Biology, and Division of Entomology, Natural History Museum and Biodiversity Research Center, Snow Hall, 1460 Jayhawk Boulevard, University of Kansas, Lawrence, Kansas 66045-7523, USA

Abstract.—The fossil pelecinid *Pelecinopteron tubuliforme* Brues (Proctotrupoidea) is redescribed and figured based on a single, complete male preserved in middle Eocene (Lutetian) Baltic amber. Brues' original material is missing but comparison with his description and figures allows for positive identification of the species. Since the type material for this genus and species are untraceable and presumably destroyed the new specimen is herein designated as a neotype for the purpose of stabilizing the nomenclature and identity of this, the only definitive fossil of the family Pelecinidae.

The family Pelecinidae comprises the giants of the superfamily Proctotrupoidea with slow-flying individuals ranging in size from 25 to 60 mm in total length. The family is today represented by only three extant species, all restricted to the Western Hemisphere—*Pelecinus polyturator* (Drury) is known from southeastern Canada, the eastern United States and Mexico, and south to northern Argentina; *P. dichrous* Perty in southeastern Brazil, Paraguay, Uruguay, and northern Argentina; and *P. thoracicus* Klug presently known only from western Mexico. Little is known of *Pelecinus* biology aside from some melonlonthine host records for *P. polyturator*. Individuals of *P. polyturator* have been reared from larvae of several *Ptylophiaga* species (Coleoptera: Scarabaeidae) (see summary in Johnson and Musetti 1999). The three species were described and a key presented for their identification by Johnson and Musetti (1999).

Johnson (1998) recently reviewed the two fossil species for the family: *Pelecinopteron tubuliforme* Brues (1933) in Baltic amber and *Iscopinus baissicus* Kozlov (1974) preserved as a compression fossil from the

Lower Cretaceous of the Transbaikalian region. Based on considerable differences in wing venation and uncertain affinity to *Pelecinus* or other proctotrupoids, Johnson (1998) rightfully removed *Iscopinus* from the Pelecinidae s.str. and considered it as a family of indeterminate position within the Proctotrupoidea. This action left the Eocene genus *Pelecinopteron* as the sole fossil representative for the Pelecinidae. Unfortunately, the two males and single female upon which Brues (1933) based his original description were from the ill-fated collections of the Albertus Universität in Königsberg (today Kaliningrad, Russia). During World War II this collection was destroyed by fire. Some portion of the collection was spared and today resides in the Institut und Museum für Geologie und Paläontologie, Göttingen. A personal investigation of this collection was made in July of 1999 but no material of *Pelecinopteron* could be discovered (other European institutions with amber collections were visited at the same time and additional Königsberg material was not located).

Herein I provide a new description and



Fig. 1. Photomicrograph of *Pelecinopteron tubuliforme* Brues (AMNH).

figures for a complete male of *P. tubuliforme* recently identified in middle Eocene Baltic amber and designate this specimen as a neotype for the species. Format for the description generally follows that employed by Johnson and Musetti (1999) for living peleciniids so as to aid comparison with *Pelecinius*. Measurements were made using an ocular micrometer on an Olympus SZX12 stereomicroscope and should be considered somewhat approximate since the optimal angle for some metrics was not always achievable. Microphotographs were prepared using a Microptics ML-1000 digital imaging system. The age and origin of Baltic amber has been recently reviewed in Engel (2001).

SYSTEMATIC PALEONTOLOGY

Genus *Pelecinopter* Brues

Pelecinopter Brues 1933: 19. Type species: *Pelecinopter tubuliforme* Brues 1933, monobasic and original designation.

Diagnosis.—**Male**. Inner margins of compound eyes very slightly convergent below, essentially parallel; maxillary palpus 5-segmented; labial palpus 3-segmented [I could not discern a fourth, short, basal segment alluded to by Brues (1933)]; mandible bidentate, teeth short and equal in length, outer surface without dense, elongate setae; mandibles broadly overlapping. Clypeus convex, with coarse, faint punctures scattered over surface (distinctly not strongly punctured), without elongate setae, apical margin relatively straight. Ocelli positioned in equilateral triangle near top of vertex, median ocellus at upper tangent of compound eyes. Occipital carina strong, distinctly present both medially and laterally. Antenna filiform, 13-segmented; positioned slightly below midpoint of face, separated from base of clypeus by ca. $1.75\times$ antennal socket diameter; combined lengths of scape and pedicel much shorter than first flagellomere, flagellomeres elongate, basal four flagellomeres with length ca. $4.5-$

$6.5\times$ width, following four segments with length ca. $4\times$ width, distal three segments with length ca. thrice width. Pronotum annular, dorsally with posterior section trap-ezoidal, this section anteriorly bordered by strong, transverse carina; anterior to carina pronotum gently sloping down to short anterior collar. Notauli formed of posteriorly converging, strong, crenulate impressions, confluent posteriorly; mesoscutum and scutellum separated by narrow suture, suture bordered by row of large, strong foveae on scutellum; axillae narrow; scutellum weakly arched; metanotum short. Mesepisternum with transverse furrow extending from faint episternal groove posteriorly, not reaching mes-metepisternal suture. Propodeum elongate; strongly and coarsely sculptured; sparsely setose. Tibial spur formula 1-2-2; metatibia gently expanded apically, metabasitarsus distinctly elongate, longer than three immediately following tarsal segments (i.e., length of tarsal segment 1 \approx combined lengths of tarsal segments 2, 3, and 4); second tarsomere one-half length of metabasitarsus; fourth tarsomere extremely short, with inner apical margin projecting underneath fifth tarsal segment. Forewing with only two tubular veins (C and Sc+R); pterostigma elongate, tapering to point on anterior wing margin; R not extending beyond pterostigma; first abscissa of Rs slightly angled toward wing base, subequal in length to basal vein (i.e., first free abscissa of M); r-rs arising slightly basad pterostigmal midpoint (distad pterostigmal midpoint in *Pelecinius*); Rs forking slightly basad pterostigmal apex and distad forewing midpoint, forming two branches, Rs1 and Rs2, each branch equally pigmented and reaching to wing apex; Rs1 arching anteriorly before extending to wing apex; medial cell elongate; Cu reaching wing apex, slightly more heavily pigmented near wing margin than distalmost abscissae of Rs1, Rs2, and M; 2cu-a slightly distad 1m-cu; veins more strongly pigmented in basal two-thirds of wing (i.e.,

from slightly beyond pterostigmal apex to base of wing) except around second abscissa of Rs+M and anal vein with associated crossveins (i.e., 1cu-a and 2cu-a) very faintly indicated; membrane hyaline; venational details presented in figure 4. Hind wing without venation except C along anterior margin; without closed cells; membrane hyaline. Metasoma elongate; sixth metasomal segment swollen and enlarged, with strong teeth along longitudinal midline of sternum, first tooth at midpoint of sternal length, second tooth near apical fourth; sixth tergum and sixth sternum partially fused (i.e., suture between them exceedingly faint), same for

seventh metasomal segment; seventh metasomal segment generally falcate; parameres elongate. **Female.** Surviving specimens unknown; based on descriptive details in Brues' (1933) original description the female is generally as described for the male herein except for sexual differences. This will require confirmation when new material of the female sex is discovered.

Comments.—Brues (1933) originally proposed a separate family, Pelecinopteridae, for this genus while noting its strong affinity to Pelecinidae. Owing to the enormous similarity of *Pelecinopterou* with *Pelecinius* I agree with most authors (e.g., Johnson 1998) that the two genera should be placed in a single family.

KEY TO GENERA OF PELLICINIDAE

1. Antenna 14-segmented; malar space well-developed; r-rs arising in distal half of pterostigma; forewing with infuscation (particularly in costal cell, along anterior margin, and at apex); metabasitarsus distinctly shorter than following tarsomere; male metasoma clavate; body size large, ca. 25–60 mm (extant; Western Hemisphere) *Pelecinius* Latreille
 - Antenna 13-segmented; malar space extremely short; r-rs arising in basal half of pterostigma; forewing apparently without infuscation; metabasitarsus distinctly longer than following tarsomere; male metasoma elongate; body size moderate, ca. 10–15 mm (early Cenozoic amber; Europe, northern Asia) *Pelecinopterou* Brues
-

Pelecinopterou tubuliforme Brues

(Figs. 1–4)

Pelecinopterou tubuliforme Brues 1933: 20. Kozlov 1974: 145 (translated version 1974: 137) [partial Paleocene amber specimen]. Johnson 1998: 2 [descriptive notes].

Diagnosis.—As for the genus (see above).

Description.—As described for the genus with the following additions: **Male.** Total body length (excluding antennae) 10.9 mm; forewing length 4.3 mm; head length 1.5 mm (head width indeterminate owing to angle from which front of face can be seen through amber surface); malar space length 0.07 mm; length of compound eye 1.1 mm; metasomal length 8.4 mm; length of first metasomal segment 1.0 mm; length

of second metasomal segment 1.0 mm; length of third metasomal segment 1.0 mm; length of fourth metasomal segment 0.8 mm; length of fifth metasomal segment 1.3 mm; length of sixth metasomal segment 1.9 mm; length of seventh metasomal segment 1.4 mm. Coloration of integument not well preserved, where evident apparently dark brown to black throughout.

Clypeus with sparse, faint, rather small, coarse punctures, integument otherwise smooth; remainder of head with minute, scattered punctures, integument between smooth. Dorsal-facing surface of pronotum with posterior portion separated from collar by transverse carina, integument of dorsal surface with minute punctures separated by a puncture width, integument



Figs. 2-3. Photomicrographs of *Pelecinopteron tubuliforme* Brues (AMNH). 2. Lateral view of mesosoma and head. 3. Lateral view of distal metasomal segments (from left to right = segments 7, 6, 5, 4, and apex of 3).

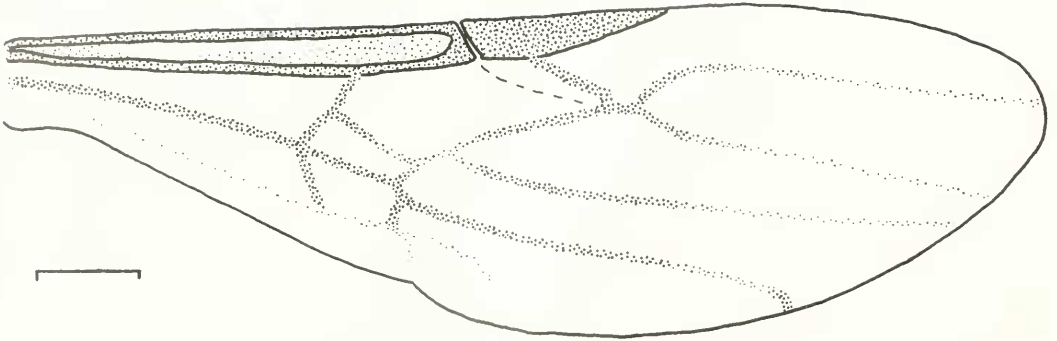


Fig. 4. Forewing venation of *Pelecinopteron tubuliforme* Brues (AMNH). Scale bar = 0.5 mm. Dashed line indicates an alar fenestra.

between smooth or slightly imbricate; lateral surface of pronotum with dorsal third smooth except along border with mesoscutum with minute punctures separated by a puncture width or slightly more, integument below smooth patch pronotum with large and strong punctures, punctures nearly confluent, integument between punctures (where evident) smooth. Mesoscutum with crenulations along lateral and anterior borders; notauli strongly impressed and crenulate, fusing posteriorly; integument in crenulations smooth, otherwise integument with minute punctures separated by a puncture width or slightly more; tegula with minute punctures separated by a puncture width, integument between punctures smooth; scutellum with strong and deep foveae along margins to form a small, medial, horizontal surface, integument in foveae smooth, on medial surface with minute punctures separated by a puncture width or slightly more, integument between punctures smooth. Mesepisternum with large and strong punctures, punctures nearly confluent, integument between punctures smooth; with transverse depression anteriorly connecting to short and more faint episternal groove (posteriorly this groove does not reach to the suture between the mes- and metepisternum), integument inside of groove smooth, above groove integument with minute punctures separat-

ed by a puncture width or less, integument between punctures smooth. Metepisternum sculptured as on mesepisternum below transverse groove. Propodeum sculptured as on mesepisternum below transverse groove except posteriorly punctures fusing to form large areolae. Metasoma with minute punctures widely scattered, integument otherwise smooth. Setae generally minute (less than a single ocellar diameter in length) and sparse except on legs, metasoma, and borders of pronotum and mesoscutum slightly more extensive but distinctly not dense. **Female.** Surviving specimens unknown; from the few descriptive notes provided by Brues (1933) females are generally as described for the male (above) aside from the typical sexual differences and perhaps some slight variations in sculpturing of the mesosoma.

Material.—**Neotype (here designated).** Male, Baltic amber, middle Eocene (Lutetian); labeled "Neotype, *Pelecinopteron tubuliforme* Brues, desig. M. S. Engel [red label]"; deposited in the Amber Collection of the Division of Invertebrate Zoology, American Museum of Natural History, New York. This specimen is designated in accordance with Article 75.3 (ICZN 1999) and for the express purpose of clarifying and stabilizing the taxonomic status of *P. tubuliforme*. The new specimen originates from the same deposits as the original series (i.e., the middle Eocene "Blue Earth"

deposits of northern Europe, from which Baltic amber originates: see Engel 2001). Although the holotype was originally a female, two males were also described and the current specimen corresponds in all observable details to those features described for the male by Brues (1933). Thus, in accordance with Article 75.3.5 the neotype may be based on a different sex (in this instance, a male).

Comments.—As mentioned above, the original material upon which Brues (1933) based his description is missing (and perhaps destroyed with the bulk of the Königsberg collection during World War II). A partial specimen consisting of only a male metasoma is known in Paleocene amber from Sakhalin, Russia (Kozlov 1974, Johnson 1998). No other specimens are presently recorded for this taxon. Thus, the specimen described herein is the only complete, surviving individual for the species and the only one originating from the same deposits as the original type series. When a more complete specimen of the species from Paleocene amber of Russia is discovered it may prove to be a separate species from *P. tubuliforme*. For example, the photograph published by Johnson (1998) does not clearly show the ventral teeth on the swollen sixth metasomal segment. Other differences may come to light with more completely preserved material.

ACKNOWLEDGMENTS

I am grateful to Hans Jahnke for providing rooms in the Institut und Museum für Geologie und Paläontologie, for hosting my visit to Göttingen in 1999, and for general information on the amber collection; to David A. Grimaldi for bringing this specimen to my attention; to Tam C. Nguyen with help accessing literature; and to Allan H. Smith-Pardo, E. Eric Grissell, and two anonymous reviewers for commenting on the manuscript. This is contribution Nr. 3282 of the Division of Entomology, Natural History Museum and Biodiversity Research Center, University of Kansas.

LITERATURE CITED

- Brues, C. T. 1933. The parasitic Hymenoptera of the Baltic amber: Part 1. *Bernstein-Forschungen* 3: 4–178.
- Engel, M. S. 2001. A monograph of the Baltic amber bees and evolution of the Apoidea (Hymenoptera). *Bulletin of the American Museum of Natural History* 259: 1–192.
- International Commission on Zoological Nomenclature. 1999. *International Code of Zoological Nomenclature* [4th Edition]. International Trust for Zoological Nomenclature; London, United Kingdom; xxix+306 pp.
- Johnson, N. F. 1998. The fossil pelecids *Pelecinopteron* Brues and *Iscopinus* Kozlov (Hymenoptera: Proctotrupoidea: Pelecinidae). *Proceedings of the Entomological Society of Washington* 100(1): 1–6.
- Johnson, N. F., and L. Musetti. 1999. Revision of the proctotrupoid genus *Pelecinus* Latreille (Hymenoptera: Pelecinidae). *Journal of Natural History* 33: 1513–1543.
- Kozlov, M. A. 1974. [An early Cretaceous ichneumon of the family Pelecinidae (Hymenoptera, Pelecinoidea)]. *Paleontologicheskii Zhurnal* 1974(1): 144–146. [In Russian; English translation in *Paleontological Journal* 8(1): 136–138]